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GTI PROJECT NUMBER 20754

Validation for Flaw Acceptance of Mechanical Damage to Low Stress Natural Gas Pipelines

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Project Objectives

The objective of this research is to develop flaw acceptance criteria to provide safe alternative options to the repairs of mechanical damage on gas pipelines operating at stress levels below 40% of the Specified Minimum Yield Strength (SMYS).

The results will provide field protocols and guidelines for use by personnel to decide whether the encountered damage warrants repair or not; thus increasing the safety of the operation at these stress levels and potentially saving costs associated with repairs that are normally applied to highly stressed pipelines (over 40% SMYS).

The proposed research includes performing tests at various damage levels to provide the confidence needed for establishing the repair/no repair criterion. The results will be implemented in a selected model and procedure. The recommendations will be proposed to the appropriate standard development organizations (e.g. ASME, ASTM, etc.) for consideration as an industry standard.

Technical Progress and Results

- Developed the testing matrix to evaluate the effect of the following parameters on pipe failure when pipe is subjected to flaw at low operating stress (40%SMYS):

  - Pipe grade
  - Pipe size (diameter and wall thickness)
  - Pipe material toughness
  - Damage type (gouge and Dent sizes)
  - Damage size (gouge angle, length, and width)
  - Field simulation of backhoe damage

- Established a testing procedure for applying controlled gouges and dents and for performing pressure tests.

- Performed the first set of the testing program with the testing parameters shown in Table -1.

Future Activity

- Complete the procedures for establishing the validation of the test matrix.
- Submit a report : A testing procedure to apply realistic mechanical damage to the pipe,
- Continue the testing program as per Task-2.

Table 1 - Testing parameters of Set-A

No. of Pipes tested	Pipe Diam. (in.)	Wall Thick. (in.)	Pipe (D/t)	Pipe Grade	Gouge (in.)	Dent (in.)	Gouge Shape	Gouge Length	pressure during damage application (psi)
3	8.25	0.25	33	X52	0.09	0.8-1.1	90^{O} constant gouge	12 inch	1,250
3	16	0.25	64	X42	0.09	1.2-1.4			525

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